

Inventions & Innovation Project Abstract

A Low-Cost, High-Efficiency Periodic Flow Gas Turbine for Distributed Energy Generation

Ventions, LLC is developing a an innovative micro gas turbine engine capable of achieving higher thermal-to-electric efficiencies (in the 39-48 percent range) and 40 percent lower manufacturing costs compared to state-of-the-art microturbine designs, while retaining the compact-size, low-emission, and low-noise/vibration advantages typical of gas turbines. This project seeks to evaluate overall technical and economic feasibility of the proposed system through a combination of analytical and experimental efforts, beginning with the highest risk areas, namely those associated with transient operation and fast-switching of the engine flow.

Ventions, LLC plans to overcome the limitations of current recuperator deigns commonly used in today's microturbines by using a regenerator as a more effective and lower-cost form of heat exchanger, whereby periodic-flow through the device is initially used to extract heat from the exhaust stream, temporarily store it in a ceramic matrix, and then subsequently release it to the inlet flow. This not only allows use of simpler and cheaper-to-manufacture geometries, but also potential configurations using ceramic materials that enable higher microturbine temperatures (and hence, efficiencies).

Since the use of regenerators introduces additional flow-switching and sealing complexity, the proposed technology utilizes an innovative engine geometry that allows all flow switching valves to operate in the cold section of the engine. This innovation eliminates one of the primary challenges (and cost-drivers) encountered in more traditional high-effectiveness regenerator-based engine designs, namely, the requirement to operate valves and seals in high-temperature environments for long periods and multiple cycles.

This technology supports EERE's stated goals by enabling clean high efficiency distributed energy generation to improve the reliability and efficiency of electricity generation and delivery. Microturbines have high economic potential because of their small number of moving parts, compact size, light weight, and low emissions. This project's proposed improvements in recuperator technology are key to improving the economics of current microturbine systems.



Contact

Ventions, LLC
818 Duncan Street
San Francisco, CA 94131

Contact: Amit Mehra
Telephone: 202-213-2846
Email: amit.mehra@ventions.com



U.S. Department of Energy
**Energy Efficiency
and Renewable Energy**